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(54) Graduated density felt.

(57) An absorbent material having graduated density is manufactured by needling a web. Before needling but after tacking the web is of substantially constant density across its thickness, and needling is carried out so that the needles penetrate the web to the extent that only the surfaces of the web are needled.

The absorbent material is useful in particular for medical and surgical applications, where it is desirable that the material should exhibit delayed fluid strike through.

EP 0 388 062 A2

GRADUATED DENSITY FELT

The present invention relates to a method for the manufacture of an absorbent material having graduated density, and to an absorbent material manufactured by this method.

Absorbent materials of this type are particularly suitable for use as medical or hygienic absorbents, for the absorption of body fluids, for example in surgical dressings, sanitary products and incontinence products. It is a requirement of such absorbents that they should absorb the fluid away from the surface of the absorbent in contact with the source of fluid, but that fluid strike-through, that is the passage of fluid through the surface of the absorbent remote from the source of fluid, should be delayed as much as possible. In this way, the interval between the replacement of a used absorbent with a new absorbent can be extended.

Attempts have been made to provide absorbent materials with delayed fluid strike-through, and it has been found that materials which have dense surfaces and a less dense centre in which the fluid can pool, demonstrate this delayed fluid strike-through.

One such material has been produced which comprises two stitch bonded layers lightly tacked together by needling. This construction has the effect of sandwiching a layer of air between two relatively dense layers, and results in a composite material with delayed fluid strike-through. This material has the disadvantage that it is relatively expensive to produce, and provides limited cushioning to the wound.

It is also known to provide a material having graduated density, in which a felt is produced which has fibres the density of which vary across the layers, the finer fibres producing a more dense felt, and this felt is then needled to produce a material the density of which is graduated across its thickness. The disadvantage of such materials is that they are expensive to produce. Such materials have not been used as surgical dressings, but as filtration materials and as synthetic leathers.

It is an object of the present invention to provide a method for the manufacture of an absorbent material in which the above disadvantages are reduced or substantially obviated. It is a further object of the invention to provide an absorbent material manufactured by this method.

The present invention provides a method for the manufacture of an absorbent material having graduated density by needling a web, characterised in that the web, before needling but after tacking, is of substantially constant density across its thickness, and in that needling is carried out so that the needles penetrate to the extent that only the surfaces of the web are needled.

The invention further provides an absorbent material which has been manufactured by the method according to the invention.

The web for use in the method according to the invention preferably comprises a major proportion, up to 100%, of hydrophilic fibres, which may be blended with a minor proportion, preferably up to 30%, of hydrophobic fibres. The hydrophobic fibres are incorporated to provide a "scaffolding", which resists compression and helps to maintain the low density structure of the centre of the material during needling, and in subsequent use, especially when the material becomes wet.

Where the web contains hydrophilic fibres; these are preferably rayon, acrylic or cotton fibres, or a mixture thereof, more preferably rayon fibres.

The web for use in the method according to the invention may also comprise 100% hydrophobic fibres. In this case, the absorbency of the web is due to the structure of the material, rather than any inherent absorbency of the fibres. Where hydrophobic fibres are present, these are preferably polyester or polyolefin fibres, more preferably polyester fibres.

In the method according to the present invention, needling is carried out using barbed needles of the type which have a section close to the point of the needle which is free from barbs, and then a section which is provided with barbs. Suitable needles include those marketed by Foster Needle under the reference number 15 x 18 x 40 x 3.5CB F.20 9-18-3B and those marketed by Groz Beckaert under the reference numbers 15 x 18 x 43 x 3.5 C333 G1002, 15 x 18 x 40 x 3.5 R333 G1909 and 15 x 18 x 40 x 3 F222 G92919.

During the needling process, after tacking, the depth of penetration of the needles is controlled so that the first barb on the needle penetrates the batt to only such a depth that substantially only those fibres which are in the denser surface region are reoriented and those in the less dense centre region should remain substantially in their original orientation. Needling may be carried out to a similar penetration on each side of the web, so that a symmetrical absorbent material which can be used with either surface contacting the source of fluid is obtained. Alternatively, needling may be carried out to a different penetration on each side of the web, to provide a material having surface regions of different density. The wound dressing produced is used with the less dense surface adjacent the wound, and the more dense surface remote from the wound. Such an arrangement of different surface densities has the effect of improving the fluid

uptake while maintaining delayed strike through.

In use, the absorbent material is preferably provided with a surface covering which is non-adherent. The absorbent material may be wrapped, in known manner, in a non-adherent material or may be bonded, also in known manner, to such a material, to form a composite article.

The composite articles manufactured in this way are particularly suitable for use as surgical dressings, sanitary towels or incontinence products.

The invention will now be further described with reference to the following examples.

In these examples, the effects achieved by varying the weight of the final product and/or the needle penetration can be observed. As a general rule, where the weight of the final product is reduced, the absorption is reduced and handling the fabric becomes more difficult. However, when the weight of the finished product is reduced, this can be advantageous in certain applications.

It appears that as the weight of the batt is increased the absorption may increase more than linearly with increased weight, apparently because as the weight increases, there is proportionately more material available in the absorbent central region.

The weight of the batt to be introduced into the loom is determined by the desired weight of the final product. In practice the batt weight is determined empincally, the feed of the batt being controlled according to the actual weight of the final product.

Example 1

A batt was produced from a fibre blend of 80% 1.7 dTex 51mm staple viscose fibres and 20% 5.0 dTex 40mm staple polyester fibres.

The felt was then needled in a three-stage operation. In the tacking stage, the batt was passed between up and down stroking needle boards, fitted with 15 x 18 x 40 x 3 F222 G92919 needles marketed by Groz Beckaert. The penetration of both the top and bottom needles was 14mm In the first needling stage, the batt was passed under a single needle board fitted with a mixture of 67% 15 x 18 x 40 x 3.5 R333 G1909 needles and 33% Foster 15 x 18 x 40 x 3.5CB F20 9-18-3B needles. Needling was carried out using a downstroke only, with a penetration of 6.1mm at a needle punch density of 83.

In the second needling stage, the partially needled batt was passed between up and down stroking needle boards, fitted with a mixture of 67% 15 x 18 x 40 x 3.5 R333 G1909 needles and 33% Foster 15 x 18 x 40 x 3.5CB F20 9-18-3B needles. The top penetration was 4.6mm and the bottom penetration 5.6mm, with a needle punch density of 329 and head speed of 509 r.p.m.

The final product weight was 300gsm.

The product was satisfactory for use as a medical absorbent, with dense surfaces and a less dense interior.

Example 2

A batt was produced from a fibre blend of 80% 1.7 dTex 51mm staple viscose fibres and 20% 5.0 dTex 40mm staple polyester fibres.

The felt was then needled in a three-stage operation. In the tacking stage, the batt was passed between up and down stroking needle boards, fitted with 15 x 18 x 40 x 3 F222 G92919 needles marketed by Groz Beckaert. The penetration of both the top and bottom needles was 14mm In the first needling stage, the batt was passed under a single needle board fitted with a mixture of 67% 15 x 18 x 40 x 3.5 R333 G1909 needles and 33% Foster 15 x 18 x 40 x 3.5CB F20 9-18-3B needles. Needling was carried out using a downstroke only, with a penetration of 6.1mm at a needle punch density of 83.

In the second needling stage, the partially needled batt was passed between up and down stroking needle boards, fitted with a mixture of 67% R333 15 x 18 x 40 x 3.5 G1909 needles and 33% Foster 15 x 18 x 40 x 3.5CB F20 9-18-3B needles. The top penetration was 0.2mm and the bottom penetration 5.6mm, with a needle punch density of 392 and head speed of 605 r.p.m.

The final product weight was 300gsm.

The products demonstrated excellent properties for use as a medical absorbent, with dense surfaces and more open centre.

Example 3

A batt was produced from a fibre blend of 80% 1.7 dTex 51mm staple viscose fibres and 20% 5.0 dTex 40mm staple polyester fibres.

The felt was then needled in a three-stage operation. In the tacking stage, the batt was passed between up and down stroking needle boards, fitted with 15 x 18 x 40 x 3 F222 G92919 needles marketed by Groz Beckaert. The penetration of both the top and bottom needles was 14mm In the first needling stage, the batt was passed under a single needle board fitted with a mixture of 67% 15 x 18 x 40 x 3.5 R333 G1909 RB needles and 33% Foster 15 x 18 x 40 x 3.5CB F20 9-18-3B needles. Needling was carried out using a downstroke only, with a penetration of 6.1mm at a needle punch density of 86.

In the second needling stage, the partially needled batt was passed between up and down stroking needle boards, fitted with a mixture of 67% R333 15 x 18 x 40 x 3.5 G1909 RB needles and 33% Foster 15 x 18 x 40 x 3.5CB F20 9-18-3B needles. The top penetration was 4.7mm and the bottom penetration 5.6mm, with a needle punch density of 337 and head speed of 501 r.p.m.

The final product weight was 190gsm.

The product was a lighter weight felt, which would be suitable for a use in medical applications where the absorbency required was not so high, and light weight was an advantage.

Claims

1. A method for the manufacture of an absorbent material having graduated density by needling a web, characterised in that the web before needling but after tacking is of substantially constant density across its thickness, and in that needling is carried out so that the needles penetrate the web to the extent that only the surfaces of the web are needled.

2. A method as claimed in Claim 1 in which the web comprises from 50 to 100% of hydrophilic fibres, and from 50 to 0% hydrophobic fibres.

3. A method as claimed in Claim 2 in which the web comprises from 70 to 100% of hydrophilic fibres, and from 30 to 0% of hydrophobic fibres.

4. A method as claimed in Claim 2 or Claim 3 in which the hydrophilic fibres are rayon, cotton or acrylic fibres.

5. A method as claimed in any of claims 2 to 4 in which the hydrophobic fibres are polyester or polyolefin fibres.

6. A method as claimed in any of Claims 1 to 5 in which needling is carried out to the same penetration at each surface.

7. A method as claimed in any of Claims 1 to 5 in which needling is carried out so that the penetration at one surface is greater than the penetration at the other surface.

8. A method for the manufacture of an absorbent material substantially as herein described.

9. An absorbent material when manufactured by a method as claimed in any of Claims 1 to 8.

10. A material according to Claim 9 which is provided with a non-adherent surface covering.

11. A surgical dressing, sanitary towel or incontinence products comprising a material as claimed in Claim 9 or Claim 10.